

## ABSTRACT

The present invention comprises the principle, theory, circuit design, computer simulation, and experimental demonstration of a new type of electronic device — the multi-cycle integration focal plane array (MIFPA) — for lock-in and/or gated imaging, spectroscopy, and/or spectroscopic imaging of extremely weak signals buried in strong background. Particularly, the MIFPA can operate in three modes — the lock-in (LI), gated (G), and gated lock-in (GLI) modes. Particularly, one MIFPA circuitry was demonstrated by simulation and experiment. Particularly, the circuitry was capable to perform the LI-, G-, and GLI- modes.

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